May 2021

M12 Background Materials CA-NGSS Standards Alignment Chart

Module 12: Urban Wildlife
CA-NGSS Alignment Chart
High School – Grades 9-12

LESSON #	LESSON TOPICS	CA-NGSS DCI STANDARD	EXTENDED LEARNING
Lesson 1 – Coyote Ecology & Resiliency	○ Coyotes in myths & legends ○ Coyote ecology and genetics ○ Coyote geography (home ranges, territories) ○ Coyote physical characteristics (morphology) ○ Coyote habitat ○ Coyote behavioral characteristics (sociobiology) ○ Coyote life cycle / reproduction ○ Ecosystem resiliency ○ Coyote classification	LS1.A: Structure and Function Feedback mechanisms maintain a living system's internal conditions within certain limits and mediate behaviors, allowing it to remain alive and functional even as external conditions change within some range. Feedback mechanisms can encourage (through positive feedback) or discourage (negative feedback) what is going on inside the living system. (HS-LS1-3) LS2.D: Social Interactions and Group Behavior Group behavior has evolved because membership can increase the chances of survival for individuals and their genetic relatives. (HS-LS2-8)	• Research the impact of human development and habitat fragmentation on top level predators like coyotes, such as: ○ Encroachment of coyotes into communities ○ Increased interactions between coyotes and humans, as well as coyotes and domestic animals • Research the impact of anthropogenic (human caused) food subsidies on coyote populations and behavior • Research the impact of increased urbanization on coyote behavior

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Lesson 2 – Coyote Population Dynamics	○ Coyote home ranges ○ Cat home ranges ○ Animal territory / niche overlap ○ Coyote diet ○ Predator/Prey relationships ○ Ecosystem carrying capacity ○ Competition for resources ○ Anthropogenic food subsidies ○ Influence of food resource availability on coyote reproduction ○ Disease transmission ○ Ecosystem biodiversity	LS2.A: Interdependent Relationships in Ecosystems Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2) LS2.C: Ecosystem Dynamics, Functioning, and Resilience ▪ A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest disturbance to an ecosystem occurs, it may return to its more or less original status. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6) ▪ Anthropogenic changes in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)	• Research, explore, and present on coyote dietary composition and present the scientific methods used for determining dietary composition • Research, explore, debate the pros and cons of, and present solutions to the issue of feral cat feeding stations ○ Research the impact of humans providing anthropogenic food subsidies to cats ○ Research the impact of feral cat colonies on disease transmission ○ Visit a feral cat colony if safe to do so or Annenberg Pet Space to observe cat behavior ○ Debate the issue of feral cat feeding stations ○ Propose potential solutions to the issue of feral cat populations

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Lesson 3 – Coyote Traits, Adaptations, and Behavior	○ Evolution of *Canids* ○ Geographic distribution of coyote species ○ Genetic variation ○ Hybridization ○ Speciation ○ Physical traits and adaptations ○ Behavioral traits and adaptations ○ Coyote IUCN species status ○ *Canid* speciation ○ Natural selection	LS3.A: Inheritance of Traits The instructions for forming species' characteristics are carried in DNA. All cells in an organism have the same genetic content, but the genes used by the cell may be regulated in different ways. (HS-LS3-1) LS3.B: Variation of Traits ▪ In sexual reproduction, chromosomes can sometimes swap sections during the process of meiosis (cell division), thereby creating new genetic combinations and thus more genetic variation. (HS-LS3-2) ▪ Environmental factors also affect expression of traits, and hence affect the probability of occurrences of traits in a population. (HS-LS3-2), (HS-LS3-3) LS4.A: Evidence of Common Ancestry and Diversity Genetic information provides evidence of evolution. (HS-LS4-1) LS4.C: Adaptation ▪ Evolution is a consequence of the interaction of four factors: (1) the potential for a species to increase in number, (2) the genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for an environment's limited supply of the resources that individuals need in order to	• Research the evolution of *Canids* and changes in group behavioral characteristics over time • Research what determines a species • Research *Canids* that have gone extinct • Research the connection of *Canids* with humans • Research and present on hybridization of coyotes with other *Canids* (wolves, domestic dog…) • Research and present on behavioral variations between domestic dogs, coyotes, and wolves • Prepare a scientific poster displaying topics explored in this lesson • Research, explore, and present on the conditions that lead to the extinction of a species

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		survive and reproduce, and (4) the ensuing proliferation of those organisms that are better able to survive and reproduce in that environment. (HS-LS4-2) ▪ Natural selection leads to adaptation. That is, the differential survival and reproduction of organisms in a population that have an advantageous heritable trait leads to an increase in the proportion of individuals in future generations that have the trait. (HS-LS4-3),(HS-LS4-4) ▪ Adaptation means that the distribution of traits in a population can change when conditions change. (HS-LS4-3) ▪ Changes in the physical environment, whether naturally occurring or human induced, have thus contributed to the expansion of some species, the emergence of new distinct species as populations diverge under different conditions, and the decline–and sometimes the extinction–of some species. (HS-LS4-5),(HS-LS4-6) ▪ Species become extinct because they can no longer survive and reproduce in their altered environment. (HS-LS4-5)	

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Lesson 4: Coyote Biodiversity	○ Human impact on coyote populations and ecosystem biodiversity ○ Coyote impact on humans, ecosystems (urban and natural), and biodiversity ○ Cohabitation w/humans ○ Human and environment impact on coyote behavior ○ Aberrant behavior (problem coyotes) ○ Physical and behavioral adaptations	LS4.D: Biodiversity and Humans ▪ Biodiversity is increased by the formation of new species (speciation) and decreased by the loss of species (extinction). (secondary to HS-LS2-7) ▪ Humans depend on the living world for the resources and other benefits provided by biodiversity. But human activity is also having adverse impacts on biodiversity through overpopulation, overexploitation, habitat destruction, pollution, introduction of invasive species, and climate change. Thus, sustaining biodiversity so that ecosystem functioning and productivity are maintained is essential to supporting and enhancing life on Earth. Sustaining biodiversity also aids humanity by preserving landscapes of recreational or inspirational value. (secondary to HS-LS2-7) (Note: This Disciplinary Core Idea is also addressed by HS-LS4-6.)	• Research behavioral adaptations that make coyotes successful in human areas • Research human impact on the environment and biodiversity • Research coyote impact on the environment and biodiversity • Research the importance of biodiversity to various ecosystems • Propose solutions to maintaining a biodiverse ecosystem • Research and report on impact of habitat destruction or fragmentation on ecosystem biodiversity

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Lesson 5: Coyote Wildlife Management *(Long Beach Case Study)*	• Coyote incidents in urban centers
	  ○ Human impact on coyote behavior
	  ○ Integrated methodology
	  ○ Mitigating interactions between coyotes/humans and coyotes/domestic animals
	  ○ Community stakeholder solutions
	  ○ Long Beach Case Study
	  ○ Narragansett Bay Coyote Study - Rhode Island Best Practices
	  ○ Culver City Coyote Management Plan
		LS2.A: Interdependent Relationships in Ecosystems
		Ecosystems have carrying capacities, which are limits to the numbers of organisms and populations they can support. This fundamental tension affects the abundance (number of individuals) of species in any given ecosystem. (HS-LS2-1),(HS-LS2-2)
		LS2.C: Ecosystem Dynamics, Functioning, and Resilience
		▪ A complex set of interactions within an ecosystem can keep its numbers and types of organisms relatively constant over long periods of time under stable conditions. If a modest disturbance to an ecosystem occurs, it may return to its more or less original status. Extreme fluctuations in conditions or the size of any population, however, can challenge the functioning of ecosystems in terms of resources and habitat availability. (HS-LS2-2),(HS-LS2-6)
		▪ Anthropogenic changes in the environment—including habitat destruction, pollution, introduction of invasive species, overexploitation, and climate change—can disrupt an ecosystem and threaten the survival of some species. (HS-LS2-7)
			• Compare and Contrast wildlife management plans from at least three (3) cities; present viable solutions to mitigate coyote incidents
			• Prepare a scientific poster addressing the topic of wildlife management of coyotes in urban centers, showcasing all case studies discussed in the Lesson
			• Debate wildlife management strategies used by various cities (lethal and non-lethal methodologies)